DOCUMENT RESUME

ED 075 094 PS 006 431

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TITLE Do Preschoolers Learning to Sort Prefer the Help of Vygotsky or Piaget?
INSTITUTION California State Univ., Northridge. School of Education.
PUB DATE [72]
NOTE 20p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Abstract Reasoning; Concept Formation; *Intervention; Language Aids; *Nonverbal Learning; Preschool Children; Preschool Education; *Sorting Procedures; Technical Reports; *Verbal Learning
IDENTIFIERS Piaget (Jean); Vygotsky (LS)

ABSTRACT

A study was conducted to determine whether language provided for the child in discriminating specific criteria helps him significantly to learn to create and hold criteria for sorting, a major difference in the theories of Vygotsky and Piaget. Specifically three questions are investigated: (1) whether 3- to 5-year-old black ghetto children can be moved further along the continuum of sorting ability to sort in two short but intensive training period; (2) which teaching method is more effective--the verbal method in which the child is given practice in sorting with verbal rules and labels supplied by the adult or the nonverbal symbolic gestural method where the child simply imitates adult actions or pantomimes his own; and (3) whether two approaches are differentially effective depending on the level of difficulty of the task, defined here as sorting by color (easiest), form (next difficult), and function (most difficult because most abstract). Ss were 123 black boys and girls from children's centers in Watts. Each child was seen twice individually and provided with a training period and refresher session between pre-testing and post-testing. Both types of training were shown to have a significant effect, but either type was as effective as the other for color and form. Verbal training was more effective for function sorting. Boys performed better with nonverbal training, and girls performed better with verbal training. (KM)

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DO PRESCHOOLERS LEARNING TO SORT PREFER THE HELP OF VYGOTSKY OR PIAGET?

ED 075094

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In his paper presented to the 3rd Annual Piaget Conference entitled "A Commentary Upon an Unusual Dialogue, etc." Dr. Zender has clarified areas of agreement and disagreement between Vygotsky and Piaget. With respect to the primacy of action in a context of adaptation, both theories agree with each other and I agree with Dr. Zender. However, with respect to the importance or weight each gives to language in development of concepts, I will have to disagree with Dr. Zender on the extent to which Vygotsky and Piaget agree. Vygotsky, it seems to me, places more weight on the importance of language.

I shall attempt to clarify this difference which emerges in their consideration of classification and then describe an experiment based on that difference and what was learned from it.

The area of making classifications has traditionally been a favorite research area for observation and theorizing about the role of language in thought. Because in order to group several items together, one must:

a. have a criterion by which to group, and
b. be able to hold that criterion in mind while making comparisons for the purpose of deciding whether an item belongs or doesn't.

The question asked in the present study is "does language provided for the child in discriminating specific criteria help him significantly to learn to create and hold criteria for grouping?

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In general it is agreed that the younger the child the more unstable and shifting a criterion will be and the more perceptually dominated. We call this unstable and concrete or associative sorting as opposed to stable and truly inferential or abstract. The more abstract the sorting, the more the person must rely on his own internally stored representations.

The following figure shows the striking similarity of the two frameworks that Piaget and Vygotsky independently arrived at to describe stages in

development of classification ability. I have placed them side by side so that you may see where they almost duplicate each other in developmental progression.

Figure 1

The study which I will describe to you attempts to move 3 - 5 year old children on this continuum toward more consistent and inferential criteria from Piagets Stage I into II_2 or from Vygotsky's State II A -D to E -F.

While this similarity of their respective schematization appears striking it should be recognized as representing a surface similarity. For Piaget places relatively little importance on language for the development of seriation and classification. He states that these are largely independent of language. The following quotation makes this quite clear.

> **In** other words we accepted from the outset that it is not enough to study the ways in which intension and extension[1] are as it were prefigured for the child in the system of verbal concepts which incorporated in common language. As a matter of fact, the results of our investigations on "all" and "some"... showed clearly that children only reach a proper understanding of the extension of verbal concepts (and also for that matter perceptual configurations) in the measure that they themselves can restructure the content. In other words, the starting point for the understanding, even of verbal concepts is still the actions and operations of the subject. (Inhelder & Piaget, 1964, pp. 283).

Vygotsky on the other hand gives language an important role in the formation not just the final naming of a concept. In discussing the child's movement from dim unstable concepts to pseudo concepts and beyond he says the following:

> (These) pseudo-concepts predominate over all other complexes in the preschool child's thinking for the simple reason that in real life complexes corresponding to word meanings are not spontaneously developed by the child: the lines along which a complex develops are predetermined by the meaning a given word already has in the language of adults. The child's own activity in forming generalizations is by no means quenched, though it is usually hidden from view and driven into complicated channels by the influences of adult speech... verbal intercourse with adults thus becomes a powerful factor in the development of the child's concepts. The transition from thinking in complexes to thinking in concepts passes unnoticed by the child because his pseudo-concepts already coincide with those of the adult. Thus the child begins to operate with concepts, to practice conceptual thinking before he is clearly aware of the nature of these operations. (Vygotsky, 1962, pp. 52-81.)

So we see that while the structure of Piaget and Vygotsky's frameworks is essentially similar and while they both give recognition to action and activity of the child, there still remains a key difference with respect to the weight given to language and especially of adult language in the role of the child's concept formation.

For Vygotsky says, "The decisive role in this process (movement from potential is true concepts) as our experiments have shown is played by the word deliberately used to direct all the part processes of advanced concepts formation." (Vygotsky, 1962). And the word we presume is supplied by the adult in interaction with the child.

A. Luria (1959, Vygotsky's brilliant student further explains the power of the adults words:

> "By naming objects and so defining their relations and connections the adult creates new forms of reflective reality in the child incomparably more complex and deeper than those which he could have formed through individual experience."

Do adult words really have that much power or is the child's own action the decisive factor?

The following study was conceived in an attempt to deal more precisely with this problem.

Specifically the following three questions constitute the heart of the study:

1. Can 3 - 5 year old black ghetto children be moved further along on the continuum of sorting ability to sort in two short but intensive training periods?
2. Which is the more effective teaching method: T_1) The verbal method in which the child is given practice in sorting with verbal rules and labels supplied by the adult or T_2) the nonverbal symbolic gestural method where the child either simply imitates adult actions or pantomimes his own.
3. The third questions asks whether two different approaches are differentially effective depending on the level of difficulty of the task, defined in this study as sorting by <u>color</u> (easiest), <u>form</u> (next difficult) and <u>function</u> (most difficult because most abstract.)

Two subsidiary questions ask whether there are any age or sex differences in performance in general and whether there are any age by treatment interaction or sex by treatment interactions.

Design and Procedure

The overall design used to test above hypotheses was analysis of variance of the difference scores in a 2 z 2 x 3 factorial design. This was followed up by specific means comparison test for further analysis. Independent variables are age, sex and type of experimental training and the dependent variables are the difference scores obtained from pre-post comparisons on the K variables of sorting by color, form and function.

FIGURE 2

OVERALL DESIGN:

Experimental and Control Groups

		MALES		FEMALES	
		Three Year-olds	Four Year-Olds	Three Year-Olds	Four Year-Olds
T_1	(Verbal)	10	10	10	10
T_2	(Nonverbal)	10	10	10	10
T_3	(Control)	10	10	10	10

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Subjects

Children were taken from six children's centers in the Watts section of Los Angeles. They were all Black. In all there were 123 subjects who were randomly assigned to treatment and control groups so that there were 60 males and 60 females subdivided into two age groups, three year olds and four year olds. Within each age grouping there were 10 males and 10 females in each of the two training groups plus a control group. The arrangements of the groups is shown in Figure 2.

Each child was taken out of the classroom to a nearby office to be worked with individually and told that he would be shown some little toys and play some games. The following procedure was used throughout. The children assigned to training of either type were seen as follows:

Day One	1.	Warm-up and pretest	10 minutes
Session One:	2.	Training: First Session	20 minutes
Day Two	3.	Training: Second Session Refresher	10 minutes
Session Two:	4.	Posttest	10 minutes

The control children were seen twice also; however, there was no training period or refresher session for them, so that they were seen for approximately 20 minutes, ten on each day. Pretest and training were done on Day One for the Experimental groups and refresher and post-test on Day Two. The same procedure of two successive days was used with the controls.

Procedure for Each Session

Pretests Warm-up

Pretest: "Same"	To determine if child understands meaning of "same'
Experimenter (E):	Do you know what I have here (shows money in plastic bag and sets out on table)?
Subject (S):	Money. (If no money, E says, "Money, right?")
E:	Can you show me any of these that are the same? (If child points to one only, then E says: "Find the other one that's the same as that.") Now watch me very carefully. See what I'm going to do. (E pushes out penny from random group and groups other pennies with it, then dimes and quarters.) See what I'm doing? I'm putting all the same ones together. Now I'm goint to mix them all up (mixes them) like this and now, can you put all the ones that go together in the same place the way I did? Try it.

If the child has difficulty, E provides sample for the child to match and helps him until all 12 are sorted.

Pretest: Color

Objects: Buttons, four each, black, blue and yellow, 1-1/4" in diameter.

E: Now we'll play a game. You close your eyes while I put something out on the table. Put your hands over your eyes and don't peek. (E puts out buttons.) Good. You're very good, you don't peek. Now when I tell you to open your eyes, you put all the ones you see that go together in the same place. OK? Open your eyes.

After the child has sorted the buttons, E asks him to help put buttons back in bag.

Pretest: Form

Objects: Cookie cutters, four each, rings, crescents and camels.

E: The E uses the same procedure as in the pretest for color. "Close your eyes" game.

Pretest: Function

Objects: Blue piano, green car, yellow and red boat, red and yellow tractor, corn flakes (individual box, Kool-Aid packet, Mortons salt (individual miniature), cracker and cheese (5¢ packet), change purse, wallet, quarter, and glass piggy bank.

E: The E follows the same procedure as above.

If the child plays more than two minutes with the objects without attempting to sort, E asks, in relation to what he is holding and playing with, in an attempt to get a sort started, "What can you put that with?"

Training: Session One

If a child has not passed form, color, or function by making a near perfect exhaustive sort, he is trained on whichever or all of those failed.

Training: Color

Objects: Marbles

T_1: Verbal

E: Now, I'm going to show you some marbles and we're going to put the ones that are the same color together. (E sets out large box of marbles and three small boxes that divide in two so that all six colors have a separate space.) Look, here's a red one and here's a yellow, let's put all the one's that are yellow here, etc. Do you know what these are and so on? (If the child errs E asks, "Is that the same color? See, this is black and that is green, etc.")

T_2: Non-Verbal

E: Now we're going to play a game called "You do what I do." See what I'm doing? (E puts reds in same box, then sets out one sample in each of the other compartments.) Now you do it. (If child errs, E merely points to correct box without explanation.)

The Ss continue sorting until all the marbles are exhausted and the E says to both T_1 and T_2, "Very good. Now let's put them all back."

Training: Color and Form (Combined)

Objects: Barrettes, each form has a distinctive color.

T_1: Verbal

E: Now let's put all those that are exactly the same together. (If child errs, E says, "Look. These are not the same. Can you tell me why?") (If child cannot say, E says, "See, this is longer, it has no hole in the middle, etc.")

T_2: Non-Verbal

E: Now you "Do what I do." E takes a barrette out to one side and nods to child to go ahead. E continues modeling only until child begins to match, to his own sample.) (If child errs, E points to difference, non-verbally.)

Training: Form

Objects: Metallic objects which are all one color consisting of thimbles, screws, and jingle-bells

E: The E uses the same procedure as in the training session for color and form.

Training: Function

Objects: The pretest-function objects are used for the training session. They include blue plane, green car, yellow and red boat, red and yellow tractor, corn flakes (individual box) Kool Aid packet, Morton's salt (individual miniature) cracker and cheese (5¢ packet), change purse, wallet, quarter and glass piggy bank.

T_1: Verbal

E: After the objects are set out, E says "Now what do we do with this (picks up corn flakes box)? Good, we eat it. Now can you find any other things here that belong with this that we can eat? Now these may not look exactly the same but why are they the same? Right, because we can eat them, so let's put all these eating things over here. What else can you find that goes together, etc."

T_2: Non-Verbal

E: Picks up corn flakes and pretends to eat from it with an imaginary spoon. Then hands box to child and nods for him to imitate and points to a place out from the whole group of objects for him to put it. So forth with each object. The eating things are all "eaten" (example: salt shaken and licked off palm, Kool-Aid sipped, etc.) the riding things each get a characteristic ride (airplane in sky, etc.), and the money things get handled typically. Quarter is put in bank and shook out, then put in purse. Toy money in wallet is taken out, looked at and put back in. After the action with the object, it is put into its own separate group of four things. At no time does E explain why they are put together, etc.

Training:Session Two

Session two is a refresher session. The barrettes are used in refresher training of the color and form sorting tasks.

Training: Function

Objects: Miniature flashlight, small bulb, book matches, birthday candle, frying pan, egg beater, measuring spoon, comb, toothbrush, soap, and mirror in comb case.

T_1: Verbal

E: Same general procedure as previous function training session

What do you do with this?

S: Comb your hair.

E: Yes, you make yourself look nice. Can you find other things to help you look nice? (After all things have been sorted, E asks child to close eyes and E puts object (frying pan) in grooming pile.)

Now open your eyes. Do you see something that's in the wrong pile? (E tries to elicit rule.) That's right, you don't comb your hair with a frying pan, etc.

T_2: Non-Verbal

E: Same as before. E allows child to handle and play with objects freely and sees if child starts to sort by himself. If not, he starts off by pretending to comb hair and places comb to one side. He models only until child begins to do it himself, or when child needs help in inventing an action for the object.

Posttest:

Posttest: Color

Objects: Buttons, four each, marroon, ivory and black colors

E: Puts out in random order and asks the S to put the ones that are the same together.

Posttest: Form

Objects: Cookie cutters, four each, shamrocks, diamonds and heart shapes

E: Puts out in random order and asks the S to put the ones that are the same together.

Posttest: Function

Objects: Dress, pants, shoes, purse, coffee pot, cup, baking pan, plastic fork, small spiral pad, pencil, crayon, chalk in box.

E: Sets out in random order and says, "Put all the things that are the same in some way, that belong together, in the same place."

All pre and posttest sorting arrays contain 12 objects. These 12 objects can be exhaustively sorted into three complete categories of four objects in each. The following is the scoring system:

1 Pair	1 Point:
2 Pair	2 Points·
3 Together	3 Points:
4 Together	4 Points:

The above scoring system was based on the number of pairs possible in each grouping, as a way of reflecting the relative strength of more objects correctly placed together in an exhaustive sorting of a category. A perfect score on the variables of color, form and function would be 18 for each respectively, and 54 for the total of all three.

If three objects are grouped together but only two of them are correct, then credit is given only for the pair. No attempt at penalizing for wrong addition is made. In other words only correct responses are scored.

RESULTS:

Results were obtained for the following number Ss that may be seen in each category that qualified for the study by having failed to pretest.

Table 1: Shows that at pretest roughly 2/3 could sort by color, roughly 1/2 could sort by form and none could sort by function.

This left for experimental training roughly 1/3 to be trained for color, 1/2 for form and all for function.

This appears to confirm the notion that more complex scanning and comparisons must be made to group by form than by color.

There was as can be seen in Table 2, a significant age difference in competence between 3 and 4 year olds at the start of the study on pre-test analysis.

In the next Table Three, we find answers to the central questions of the study. Significant differences obtained show that both training even brief as they were in this study to have a significant effect as compared with the controls who had no training. We see that this is not true for color and form. Either type was as effective as the other. However, with respect to the more inferential sorting required by the function task the verbal treatment was significant. A more refined analysis of this result shows a very interesting Sex by Treatment interaction.

Tables 4 & 5

It may be seen that when total difference scores are analyzed, there is a significant difference favoring higher level of performance on non-verbal training for boys as compared to girls. On function scores alone the compliment of this may be seen with a significant difference between the girls higher level performance in Verbal as compared to Boys in Verbal treatment. A comparison between girls in Verbal and girls in Non-Verbal is also significant, showing girls differ greatly in their ability to utilize the two interventions. Boys on the other hand show no such marked preference for either treatment.

With respect to age, there was no significant difference between 3 and 4 year olds as a result of their training. This is the initial significant difference on pre-test between 3 and 4 year olds performance was wiped out by the treatment.

CONCLUSIONS and DISCUSSION

While making no claims for the durability of the results obtained, the results of this study do support specific kinds of environmental encounter or structuring on the part of the adult as facilitating the ability to classify.

A second finding of this study is that in general the results favor the importance of language in fostering the more inferential or abstract sorting

abilities. We might say then that the Piaget position which maintains that "active construction" is most important for the derivation of classes is a position which holds for the more concrete or visible categories. However, where the categories required become more abstract, the superiority of the verbal method is shown in the present data.

It must be remembered, however, that the verbal method in this study was not entirely devoid of operations or active constructions. Children were engaged in handling materials but had what appears to be the advantage of verbal rules and attribute labels with which to organize their activities. The importance of language becomes apparent when one contrasts the results of verbal and non-verbal training along the levels of abstraction; for the lower levels of color and form where sorting criteria were highly visible, both types of training were equally effective.

Language was not necessary, perhaps superfluous at the lower levels of classification but when the difficult level of function was attempted, language while not sufficient in itself certainly became more necessary but especially for females. The finding of sex of treatment interaction in this study has intriguing implications for differential curricula. One is tempted to ask: Is learning by discovery different for boys and girls; can girls discover more in discussion than boys and do boys because they are less able to utilize verbal discussion need more activity channels by which to integrate knowledge?

Some of the incidental findings of this study validate both Piaget and Vygotsky's conception of the child as active enquirere. Over and over again 3 and 4 year olds would ask questions in regard to the items "Who spoon?" "Who dress?" "dis my pencil?" "dis you pants?" "where's da girl?" (handling clothes) "where da mommy?" "Somebody lost these?" Their preoccupation with associating these objects to contexts, people with whom they would make sense were continual evidence of their need to integrate their world.

Occasionally a child asked a question and answered himself "Where da girl" followed by "She at school."

It should further be noted that there was extreme readiness and interest of children to enter into a learning situation which left room for their imaginary symbolic play and developmentally appropriate egocentricity. For example, Darren R. picks up each item ignoring request for sorting and says:

"I make some coffee."
"I'm coloring."
"I'm a eat."
"I'm a cooking cookies."
"I'm a puttin my shirt."

When asked in the posttest "What could that go with?", for the dress, Stacey K. answered "on me." Other children literally tried to put the miniature purse handle over their wrists, or went through motions of putting trousers on.

Spontaneous recall and comparison occurred often and are evidence of the unsolicited childs own effort at integrating experience "I saw one of these at Sears." (boats) And the child who upon seeing the crescent-shaped cookie cutters said "That's a moon and that's a moon" was evidencing the kind of recall and association ability that black ghetto three to five year olds are presumed by some to have little of.

The results of a study on classification cannot be seen apart from the materials the children are asked to classify. It is an obvious but often overlook cliche in pre-school that materials that have high interest value for the student are vehicles for a further academic ride. It is doubtful that results obtained in this study could have been obtained with pictures or items of less interest to children. Vygotsky warned about making the school for young children a copy of the school for older children. It would appear that choice of appropriate materials is one way to avoid that.

So finally in answer to the question: "Do 3 - 5 year old preschoolers learning to sort prefer the help of Piaget or Vygotsky, we must answer: On color and form they can be helped by either. But on more abstract function, if they are girls they vastly prefer Vygotsky. If they are boys, they can use the help of either just as well.

Figure 1

A Comparison of Piaget's and Vygotsky's Developmental Phases of Classification

Piaget	Vygotsky
	Stage I: Syncretic
	1. Unorganized Congeries
	A. Trial and Error, Random
	B. Contiguity: Space and Time
	C. Elements Combined from Previous Groups
Stage I: Pre-Classificatory	**Stage II:**
1. Graphic Collections, Aggregates Based On	1. Complexes
A. Alignments	A. Associative, Based on Similarity, Proximity
B. Collective Objects	B. Collection
C. Complex Objects	C. Chain
	D. Diffuse
Stage II: Quasi-Classificatory	E. Potential Concept
1. Non-graphic Collections Based on Similarity Alone	
2. Mechanisms of Above: Retroaction, Foresight	F. Pseudo Concept
Stage III:	**Stage III:**
1. Class Inclusion and Hierarchial Classification	1. True Concepts

Table 1

Breakdown of Cases in Each Treatment as Seen in Pretest Scores for Whole Sample (123)

	T_1 Verbal			T_2 Non-Verbal			T_3 Control		
	Co[1]	Fo[2]	Fu[3]	Co	Fo	Fu	Co	Fo	Fu
A- Total Ss Pretested	41	41	41	41	41	41	41	41	41
Ss Scoring 16-18: Too High Passers	30	19	0	28	21	0	27	20	0
B- Ss Remaining (Subjects who participated in experiment)	11	20	41	13	20	41	16	21	41

1 Color
2 Form
3 Function

Table 2

Means, SDs, and F Statistics Between Groups Aged Three and Four on Color, Form, and Function on Pretest Scores for Total Sample

	Three Year-Olds (N=62)		Four Year-Olds (N=61)		
	$\bar{x}$	SD	$\bar{x}$	SD	F
Color	10.887	8.185	15.508	5.726	13.123**
Form	9.758	6.510	14.148	6.390	14.235**
Function	1.113	1.775	1.738	2.065	3.240

$F_{1,\ 121}$ = 3.92 at $p < .05$*
= 6.85 at $p < .01$**

Table 3

Specific Comparison Tests on the Difference Score Means for the Three Treatments

	Color N=40		Form N=61		Function N=123	
Treatments	F	Sig.	F	Sig.	F	Sig.
T_1 vs T_2 +	1.492	n.s.	.606	n.s.	7.168	**
T_1 vs T_3	39.368	**	19.787	**	54.108	**
T_2 vs T_3	27.471	**	13.398	**	21.889	**

** $p < .01$

+ Means for T_1 vs T_2 on Color: 12.091 vs 9.769
Form: 10.050 vs 8.700
Function: 6.171 vs 3.854

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Table 4

Analysis of Variance Means of Total* Difference Scores for Sex by Treatment (color, form + Fu)

			f	
	$\bar{X}$ Males	$\bar{X}$ Females	Males vs. Females	p
T_1	12.80	15.80	1.03	n.s.
T_2	15.30	7.08	10.03	.01
T_3	1.25	1.95		n.s.

* Scores for Color Form and Function taken together

Table 5

Sex by Treatment Interaction Means for Function

			f	
	$\bar{X}$ Males	$\bar{X}$ Females	Males vs. Females	p
T_1	5.08	7.35	3.46	.05
T_2	4.90	2.88	2.70	n.s.
T_3	-.28	.30		n.s.

df = $F_{2, 111}$ 3.08 at $p < .05$
4.80 at $p < .01$

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